Why ethics will be important for agricultural professionals as the agtech sector develops

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Abstract
Ethics in agricultural research and data collection on farms is a topic that is rarely considered but increasingly important as agtech becomes integrated into all facets of commercial agriculture. The aim of this paper is to introduce the ethical considerations agricultural professionals need to think through when working with client data. For example, when sharing production insights and knowledge from one client to another, including yields, strategies, inputs and financials. This paper focuses on corporate data agreements, ethical dilemmas and case studies on the use of agtech on farms and in related scenarios. What skills and knowledge do professionals need to protect a farmer's data? Developing an awareness among leaders for proficiency in ethics across the Australian primary production sector is an important development need for all agricultural professionals, as well as practitioners. Clear agreements must be made about who does and/or should own data that is generated on-farm and what legal and ethical responsibilities apply to stewards of other's data. There are always ethical considerations when developing and using agtech or any on-farm data, which professionals ignore at their own peril.

Keywords
Integrity, Data sovereignty, Artificial intelligence, Intellectual property, Privacy, Professionalism.

Introduction
The digitisation of the farm has been occurring since the personal computer became cost effective enough to be in every farm office (Leone 2017). Primarily it started as managing accounts and to a small degree some activity management. With the advent of on-farm connectivity and in-paddock devices such as the iPad launched in 2010, the rate of acceleration of digital devices and data capture has increased rapidly. With the expansion of Internet of Things (IoT) and cost-effective sensors and devices, almost every aspect of the farm and its production can now be measured, with some having the capacity for autonomous or semi-autonomous control (Shepherd et al. 2018). With this brings greater data collection on farm and potentially greater transparency of farm operations, both publicly and to private corporations (Carbonell 2016). This generates unique challenges around the collection, use, reuse, and sharing of farm data (Jakku 2019, Flemming 2018). The majority of farmers are considered digital immigrants, being above 54, compared with 13% under 35 (digital natives) born into the digital world (Binks et al. 2018). It is not just the farm that is being digitised but the entire agtech ecosystem surrounding the farm. In this paper, using the case study method, we explore some of the challenges and ethical dilemmas that are often faced by the professional agricultural community related to data usage, particularly for advisors, scientists, agronomists and sales professionals.

Ethics and the on-farm enterprise
General issues
The most obvious sources of data are linked directly to the farm management and farm activities (Carbonell 2016, Fleming 2018). Logging daily activities, inputs, plans, environmental data, and yield estimates are all very common. The data associated with these activities are important for farmers and their direct advisors, however there is also interest in understanding this farm level data from input suppliers and downstream supply chain partners (Carbonell 2016, Rose 2021). The question of data ownership is not always clear. 'The farmer owns the data' is the default concept, as the farmer owns the tangible assets from which the data was derived. The data itself forms part of the farm operation's intangible assets. This is easy to manage if all on-farm systems are ring-fenced and can be used and managed by the farmer themselves. However, in the online and cloud-based world this is not always the case. When a farmer uses a system or engages with a service provider for any activity, their farm data is potentially available beyond the bounds of the farm and immediate advisors. Similarly, license agreements for software related to farm monitoring or production circumvents the default 'farmer owns the data' paradigm by giving access to that data to the technology proprietor. This is where an ethical dilemma for industry professionals starts. Data ownership and usage

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rights is often ambiguous and there is little guidance for farmers or industry professionals alike to navigate the legalities of data use and ownership. Fortunately, industry and one of its associations in Australia, is taking the lead in providing professional development that includes an understanding of ethics and a way forward for navigating the ambiguity of agricultural ethical dilemmas. It is reasonable to expect, however, that this will be insufficient over time, and legislation will emerge to address laggards, forcing them to demonstrate their capability and approach to ethics (Rose 2021).

Industry Self-Regulation

The Australian Farm Data Code (NFF 2020) provides guidance to inform the policies of service providers who manage data on behalf of farmers, which is similar to the voluntary codes being developed in the USA and Europe (Van der Burg et al. 2020). However, there are still gaps in these guidelines and these have resulted in legal action (Rasmussen 2016).

Another self-regulation approach is the Chartered Agriculturalist (CAg) scheme developed by Ag Institute Australia (AIA). Accreditation (CAg – Chartered Agriculturalist) requires applicants to adhere to the Ethics Policy and Code of Ethics (Ag Institute 2018) and pass a timed ethics examination (Guerin et al. 2019). An example of a scenario from the ethics masterclass, and typical of the types of questions used in the ethics examination, is as follows:

"You are an agricultural advisor with a grower client who uses yield mapping from her harvest equipment through the 'Megafarms Mapping Tool'. As an advisor you have 3rd party access to the software tool, however, you pay no subscription fees. You find access to the tool very useful in identifying issues across the farm which you can then "ground truth", and with the grower, you help to address areas of low productivity across her farm. As an advisor, industry identity, and professional you are often asked to present at forums and facilitate workshops on the topic of precision agriculture. You like to share your experience and help the industry and individual growers adopt digital tools and assist the overall productivity of the industry across your region. You are careful to work within your areas of expertise and do not provide advice outside of this area, which is in precision agriculture, as well as emerging areas of digital agriculture. In a public agronomy forum in the region in which you advise and consult, you demonstrate the capabilities of Megafarms Mapping Tool and show your farmer client's yield maps (which you have anonymised). In addition, you aggregate her data with all your client's data from the same region for benchmarking to illustrate the capability of the software to other growers."

Discussion of the ethical dilemmas from this scenario are centred around the following:

1. What are the ethical dilemmas that can be identified from the case study?
2. Specifically, which of the elements of the AIA Code of Ethics may have been breached?
    a. act based on a well-informed conscience and be discerning and do what you think is right (with regards to your behaviour as a consultant/advisor)
    b. give due weight to all legal and contractual obligations (applies to all interactions with data owners and those with whom you share that data with, regardless of data anonymisation)
    c. openly declare conflicts of interest, which will allow explanation of other stakeholder's influence (especially given you have "free" access to the software which has been offered by the software provider)
    d. manage conflicts of interest (with regards to your position as a user and promoter of the software)
    e. respect confidentiality obligations including informed consent, expressed or implied (relevant in all your dealings with other's data).
3. What could you have done differently or what interventions could you have made as an agricultural professional in this situation (in the context of these breaches and guided by leading industry professionals facilitating the Masterclass)?
4. Are there other parties that have an impact on the ethics of this situation?

While there is generally some form of 'agreement' between a farmer and their business partners, these are not always understood by either party. A contract a farmer will have with their advisor is not usually explicit in relation to data ownership and usage rights, creating ambiguity. Contractual agreements should explicitly define ongoing agreements relating to data ownership, use, and sharing, not just the requirements for the immediate advisory activity. Similarly, the concept of informed consent, such that all signatories understand, as much as is possible, the implication of the agreement is paramount. It is important to acknowledge that

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with any of these activities, there will be farm data "leakage" into the advisor's (and possibly any software provider's) systems, records and knowledge. What the advisor does with this information and how they share it amongst colleagues and other clients is difficult to track or measure and can present an ongoing ethical dilemma.

Legal Requirements

Organisations are required to have a privacy policy under Australian law. This is primarily focused on managing direct contact, SPAM activities and unwanted calling, however, there are provisions for personal data storage, maintenance, and use. This is limited by a lack of provisions for different types of data, specifically farm data and its use. Conversely, an End-User License Agreement (EULA) for software will set out exactly how data is captured by the farmer's system and how it can be used. Quite often EULAs are very broad and use obtuse terms, posing a significant barrier to informed understanding of data ownership and use. Often purchasers of new devices click 'I agree" without reading the associated information because the language used in a EULA is difficult to understand and lengthy (Bakos 2014, Obar 2016). Statements may include clauses on whether the provider can access the farmer's data to improve service and products or share with partner companies. This allows considerable flexibility in data usage that can often create further ethical dilemmas. As purchasers want to be able to use the device, they must agree to everything that is stated and requested of them, creating a reduced incentive for users to fully read and understand a EULA. Staff within the supplier company also may not fully understand the specifics of an agreement or what the farmers' concerns may be. Ultimately, an individual's understanding of an agreement and ethics of the employees (advisors) themselves will ensure a fair and equitable agreement. This demonstrates the need for professional ethics to be front of mind across the agtech sector and broader agricultural industry. We expect that legislation will emerge to address laggards (in adopting ethical policies and processes), forcing them to demonstrate their training, capability, dissemination, and approach to ethics.

Ethical considerations off-farm

Farm generated data may be collected and stored off-farm and there is not always a direct relationship with the data owner. There are many technology providers to a commercial farm including software, machinery, and communications. Sometimes these are one-off interactions with limited transfer of sensitive farm generated data, but often they are long term agreements that involve large amounts of data. Consider something as simple as an automated weather station (AWS). The farm will consult the data perhaps once a day and look at 1 or 2 data sets such as rain and temperature, while the AWS may be capturing up to 16 data sets every 5-15 minutes. If this is aggregated over several years, it becomes a very data-rich source, and may be compounded with telemetry in machinery. Many advisors or advisor applications and services will need to call on third party services for analytics, modelling or forecast capabilities. The farmer's data may be shared to a myriad of other service providers who use the data to provide specific insights or analytics. The farmer's data will be managed by anonymous operators with no direct link to the data owner themselves. Clear policy within the service provider and the individual ethical thinking of the employees, will influence the correct use (or misuse) of the farm data. Similarly, open data sets can potentially risk the confidentiality of farming technologies when the risk of hacking by competitors and foreign powers are high (Leone 2017, Camarena 2020).

In most cases. when the produce leaves the farm, there is no direct link or transfer to the end customer. Produce will stop at an aggregator or sale environment where the produce is still contractually and ethically the farmer's property and responsibility. Off-farm measurements of weight and quality for produce such as livestock or grain will be captured at this phase but how often is this data returned back to the farmer (i.e. the data owner)? Ownership of this data becomes opaque and with full traceability (e.g. using a blockchain distributed ledger technology) through the supply chain to the consumer, there is potential for farm data to be flowing through these systems beyond the control of the originator (Katsikouli et al. 2020).

Conclusion

The management and use of a farmer's data has been made complex with the advent of cloud computing, IoT-enabled equipment, and integrated business and production systems. Individuals, companies, and farmers in the value chain will usually have legal agreements and standards that 'protect' the ownership of data originating on-farm. However, there is an emerging expectation for agricultural professionals to understand their ethical responsibility to protect data produced on-farm. Ethical data management will require professionals to have demonstrated a working knowledge of ethics and have confidence in raising

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concerns about data use and misuse. Proactive professional training in ethics, recognised by professional associations, such as through accreditation, builds trust with all participants in the agricultural value chain.

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